

Documenting Young Children's Technology Use: Observations in the Home

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ABSTRACT

While there has been much interest in children's use of different technologies, research is often done with school-age children in their classrooms. This exploratory research study looks at fifteen preschool children (aged three to five) in Queensland, Australia and their use of different technologies in their own homes. This paper examines data from a checklist of technologies available in the home and video recording data of children's interactions with online technologies and other people captured by parents, which were analyzed using a modified 'seating sweeps' (Given & Leckie 2003) approach to gain a detailed, descriptive analysis of the home environment.

A range of technologies are available to children, with the television and DVD player being most common in the home. Unlike desktop and laptop computers, which were restricted to adult use in half of homes, mobile computing devices (e.g., tablets and smartphones) were quite prevalent and generally available for children's use. In almost all cases children used devices designed for adults and often used them in common spaces in the home, such as the home office (38%) or living room (36%). Many children (45%) engaged independently with technology, able to accomplish activities and learn on their own. This study contributes to a growing body of literature about how young children connect to technology and the growing digital world around

them. Examining children's interaction with technology and in the home environment allows researchers to better understand the role of technology in children's lives.

Keywords

Preschool children, technology use, home environment, observational research

INTRODUCTION

Many studies have been conducted, recently, on children and youth's access to and use of various technologies, particularly with older children. In the United Kingdom (UK), for example, 26% of 12-15 year olds and 18% of 8-11 year-olds have their own tablet computers, while household ownership more than doubled (to 51% from 20%) between 2012 and 2013. The use of tablets among 5-15 year-olds also increased, dramatically, from 14% to 41% in this same year (Ofcom, 2013, p. 5). Although data on young children are often not reported in these studies, the UK's Ofcom study did note that 28% of children aged three to four use a tablet at home, with 12% using a tablet to go online (p. 9). Further, one in seven parents (14%) of children in this age group believe that their young children know more about the internet than they do (Ofcom, 2013, p. 9).

In August 2013, a report of one of the largest studies of young children's internet use was released in the European Union (EU). Among their key findings, the authors note that children are going online at younger and younger ages worldwide; in the US, for example, 25% of 3-year-olds and 50% of 5-year-olds go online daily, while 70% of 3-4 year olds go online "sometimes" in Sweden (Holloway et al., 2013, p. 8). Overall, these studies point to a general lack of data on young children's online activities, so "there is now a critical need for information about the internet-related behaviors of 0-8 year olds" (Holloway et al., 2013, p. 4).

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In the United States a series of studies done through the Joan Ganz Cooney Centre have started to examine young children's access to and interactions with online technology. Children aged 2-10 have access to a wide variety of technology: 83% to high speed internet, 76% to a video game console (50% to a hand-held), 71% to a smartphone, and 41% to an educational gaming device (Rideout, 2014). Children 5 and under who have internet at home use it at least once a week, frequently to play games and increasingly on mobile devices such as laptops, tablets, and smartphones (Gutnick, Robb, Takeuchi, & Kotler, 2011). Approximately two-thirds of children aged 4-7 have used iPhones typically to play games; often that access is limited and the device is "passed back" from the parent to the child (Chiong & Shuler, 2010).

This paper presents results of a recent study in Queensland, Australia, that addressed the following research problem: How do young children interact with information technology (e.g., tablets; smartphones) in the home? Technology "use" was defined broadly to include physical engagement with technology (e.g., typing), as well as watching, singing, or other forms of engagement.

REVIEW OF THE LITERATURE

Studies of Young Children and Technology in Information Science

Most studies of children's information technology use in Information Science focus on children's formal, school-related information activities. Large (2005) provides a comprehensive review of much of this literature on children aged five to eighteen, but notes that "little attention has been directed at information seeking by very young users" in this age group (p. 355). Studies of children's internet and database searching activities in the school context examine various tools and tasks, often using imposed queries (e.g., Hutchinson et al., 2007; Nasset & Large, 2004; Bilal, 2002; Large, Beheshti, & Rahman, 2002; Hirsh, 1999; Solomon, 1993). Foss et al. (2012) is one of only a few studies to explore children's experiences in the home context. They recruited children aged seven, nine and eleven to examine their Google searching practices, resulting in an in-depth analysis of searcher types. McKechnie (2004) gathered data on the personal collections of books and media in the homes of children aged four to twelve, and found "common uses of the Internet included email, gaming, searching for school project information, and searching for personal interest information" (p. 80). Overall, there are very few studies of very young children in the field that explore information technology use or connections to online collections of materials.

Studies of Young Children & Technology in Education

In Education, studies of young children's personal engagement with technology are few in number (e.g., Freeman & Somerindyke, 2001; Kolås, Munkvold, & Thorshaug, 2010), particularly in the home environment

(e.g., Stephen, Stevenson, & Adey, 2013; Plowman, McPake, & Stephen, 2010). However, some studies have shown clear differences between children's engagement with technology in the home, compared to preschool environments. Marsh (2006) and Yamada-Rice (2010), for example, investigated four year olds' active engagement with technology in preschool while learning to read and write. Davidson (2014) investigated three to five year-old children's online searches at home and in pre-school, as well as the resulting multimodal reading that took place with adults. As Radich (2013) notes, "As devices and apps become more user friendly, younger children are becoming increasingly proficient in using technology tools to accomplish a task—making a picture, playing a game, recording a story, taking a photo, making a book, or engaging in other age-appropriate learning activities" (p. 6). However, Plowman et al. (2011) found that, at home, young children may choose not to use computers even if such use is encouraged; instead, many young children watch TV and DVDs or play with game consoles, when given the choice (p. 368).

Most studies investigating technology use in the home rely on adults' perspectives, typically through the use of parent surveys. Zevenbergen and Logan (2008), for example, found that parents of 4-5 year olds attending preschools in Australia reported using the computer frequently for various activities, such as drawing and to access the internet (pp. 40-41). This use indicated that preschoolers have many computer competencies, such as mouse skills and the ability to type letters and words (pp. 41-42). Rideout and Hamel (2006) found that parents believed children's computer use had educational benefits, due to a perceived need to use computers later in life (p. 15). Interestingly Plowman et al. (2008) found that parents do not provide much explicit tutoring in computer use, believing preschoolers will simply pick up knowledge about technology. Thus, children typically learn by being self-taught, through trial and error, by copying, and by learning from observation, all of which is invisible to most parents (p. 311). Despite the growing number of studies that explore young children's use of technology, only a few use research methods that engage preschoolers directly or gather empirical data of the actual 'doing' of things. Ellis and Blashki (2004) report results of a home-based study where two-year-olds tested software on an adapted laptop. More recently, Disney et al. (2013) presented results of an observational study of preschool children's use of iPads in childcare centers in Australia. They found that young children can engage actively with the iPad, have fun playing with the device, and that the touch screen is easier for children to use than a traditional mouse and keyboard (p. 5). However, neither of these studies involved video recording of children's activities, as reported here.

RESEARCH DESIGN

This paper reports results from one phase of a large study designed to explore young children's (i.e., aged three to

five) experiences accessing information technology resources in home and preschool classroom environments. The project explored the extent to which web use was a part of home and school-based experiences, examining both the tools used and the interactions that occurred during children's use of technology. Participants were recruited from eight early childhood centers in Queensland, Australia. The full study design included observational research in classrooms, surveys of teachers and parents, and observational research in a sample of 15 children's homes. This paper reports on results from the home-based dataset, which comprised video recordings made by parents of children's interactions with online technologies and with other people, as well as checklists of available technologies.

Parents recruited for this phase of the study were informed

of the project's goals before they provided written consent. The informed consent process requested permission to record the child participants engaging with technology in the home; consent was given to use recorded images in publications, with assigned pseudonyms. Over a six-week period, participating parents videotaped their children using technology. Parents were instructed to record all instances of technology use by their children during a one-week period. The full video dataset comprised twenty-nine hours of video recording, showing children using laptops, desktops and a range of handheld devices. Technology inventories were also completed by parents in eleven of the fifteen homes, providing details on technologies available at home, even those not observed in the recordings.

The video recordings were analyzed using a modified

	Adult Use only	Child and/or Adult Use	Do Not Own	Total Available^a	Observed on Video^b
Television	0	19	0	19	5
DVD Player	1	15	0	16	3
Printer	5	10	7	15	2 ^c
Digital Camera	7	7	1	14	2
Laptop	9	4	1	13	7
External Hard Drive	11	1	1	12	3
Desktop	5	6	1	11	7
Wireless internet	4	7	1	11	NA ^d
Smartphone	5	6	4	11	7
Stereo System	2	8	3	10	1
Scanner	6	4	1	10	0
Tablet	2	8	3	10	10
MP3 Player	2	5	3	7	2
Digital Video Camera	4	3	3	7	1
GPS	3	3	5	6	0
Wired internet	1	3	8	4	NA ^d
Cable/Satellite TV	1	2	8	3	0
Internet TV	0	1	10	1	0
E-Reader	0	0	11	0	NA

^a Some homes had more than one specific tool. These data are from the eleven homes that completed the inventory.

^b Data from all fifteen homes are included in the "observed" column.

^c Although the printer was not seen on screen, this child printed during the session and retrieved the document from another place in the home.

^d Numbers of wired vs. wireless internet could not be confirmed in the observational dataset.

Table 1: Technologies available in participants' homes.

‘seating sweeps’ (Given & Leckie, 2003) approach to provide a detailed descriptive analysis of the physical home environment. In some cases, children worked alone and in silence; in others, they talked to parents, sang along with computer programs, and engaged in various other activities while engaging with technology. The observational data were coded following the systematic method developed by Given and Leckie (2003). This method provides a systematic way to record details of observed behavior related to who is in a space, the activities in which they engage, the location of the activity, and the personal belongings they had with them (p. 375). Although the ‘seating sweeps’ method was developed for use in real-time, the systematic data coding process can also be applied to video recordings; here, the analyst codes the data as though they were physically in the room with the participant, noting the various activities and materials in the space, in the specific location.

Using the young child participant as the focus of the investigation, all twenty-nine hours of video were coded for three main points of observation: location (e.g., bedroom); materials (e.g., iPad); and, activities (e.g., singing). Other people present in the space (e.g., parents; siblings) were noted alongside the materials, including data on any interactions that occurred with these individuals. Similarly, if children interacted with materials other than technologies (e.g., dolls), these were also coded for analysis. In some cases, children engaged in more than one activity or had more than one type of material/companion with them while engaging with the technology. Although the location of individual recorded instances was fixed (i.e., a child observed in a bedroom using technology remained in that space for the full recording), some children used various locations at different times during the data collection period.

Coding checklists were developed and field notes compiled based on the details that emerged during data collection. The end result was an exhaustive list of all children’s activities in their homes for all of the recorded sessions, which could be analyzed for common trends. This paper presents the quantitative results of the analysis. An inductive, thematic analysis was also completed with the dataset, to examine the children’s activities in the context of the theory of everyday life information seeking; those results are published elsewhere (Given et al., 2014).

RESULTS

Technology Devices Available in the Home

The parents’ technology inventories demonstrate rich technological environments in the home (see Table 1). Although the sample is small (i.e., eleven homes), similar data at this level of detail have not been published previously for young children’s homes. Parents provided a list of technologies available in the home, noting which devices (if any) were restricted to adult use. In many cases, homes had more than one of a particular device. For

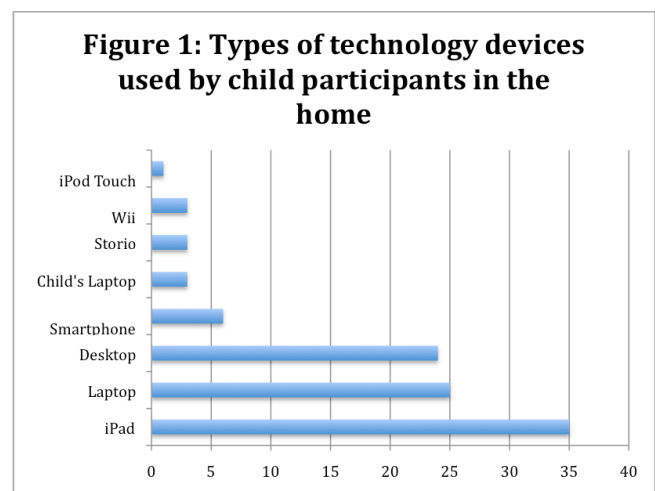
example, there were nineteen televisions available for child use, with each home having at least one. The most commonly owned computing-related device was a printer (fifteen available), with ten available for child use; although printers were not viewed, on screen, during the video observations, two children printed their work and retrieved documents from another location during the recordings.

Laptops were the most prevalent types of computer in the home (thirteen available); however, most of these (nine) were restricted to adult use. Of the eleven available desktops, just more than half were available to children (six) with the remainder (five) restricted to adults. Tablets were fewer in number (nine), overall; however, the vast majority of these (seven) were available for child use, with very few (two) restricted to adults. Of the eleven smartphones in the home more than half (six) were available for child use. Children also had access to a large number of digital cameras (seven of fourteen available) and digital video cameras (three of seven available); however, none of these were used during the observed sessions.

Parents also noted a number of “other” technologies available in the home, including game consoles (e.g., Wii; Playstation; Nintendo DSi) and devices designed specifically for young children (e.g., Leapster); five of these devices were observed on the video recordings. Parents also mentioned a number of different computer programs that children used. These included games (e.g., Angry Birds), literacy/numeracy educational programs designed for young children (e.g., Reading Eggs; Starfall; ABC Kids; Mathematics Online), music applications (e.g., Kids Music; Mickey Mouse Disney Sing-a-long), and other programs (e.g., storybooks; cooking applications; search engines).

Technology Devices Used By Young Children

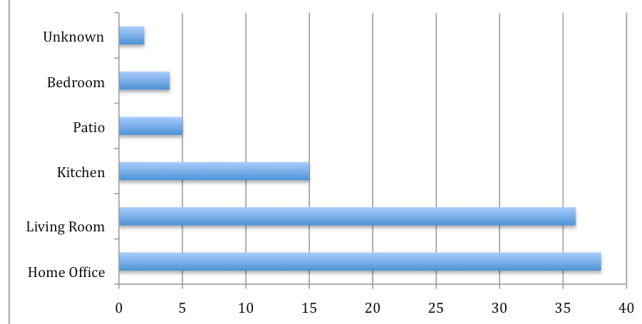
In the video recordings, children were observed using various technological devices across a range of activities. Figure 1 presents an overview of the types of technology used by the young children in their homes. iPads were the



most common devices used (35%), followed by laptop (25%) and desktop (24%) computers. Only 6% of children were using devices designed for children, specifically; for example, VTech has produced the Storio device and other laptops designed for young children, which were observed in the dataset. In the vast majority of cases (i.e., 94%), children were using devices designed for adult use.

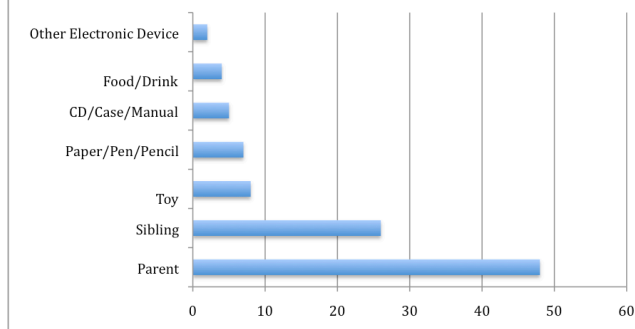
As noted in Figure 2, children used these devices most commonly in the home office (38%) or living room (36%). The home office was generally arranged for the adults in the home, in terms of furnishings and resources; children were allowed time to use the desktop computer in these spaces, often with the help of parents who inserted CDs or helped with typing. In two cases, parents used timers to limit the amount of time children spent on the computer. Observations of children, siblings, and parents, using laptops, iPads, smartphones, and wii console were typically in the common living spaces (e.g., living/media room; kitchen; dining room), where interaction was more common. Although some children sat at desks and tables in these spaces (e.g., to use desktop and laptop computers), others chose to sit on couches, chairs or the floor of the room. Some children used their devices in the kitchen or dining area of the home (15%), with only a few using an outdoor patio (5%) or bedroom (4%) space. One example of using the laptop at the kitchen counter/bench involved the child and two siblings each taking turns sitting on one stool to play an online game.

Figure 2: Locations where child participants engaged with technology in the home



Almost half of the time (45%), children engaged with technology alone; in the majority of cases (55%), there was at least one parent (48%) and/or a sibling (26%) in the room (see Figure 3). However, even when other people were present, they did not always engage with the child participant. For example, one parent present in the room made a grocery list while their child watched a video; another parent started the child on the computer task, but then left the room. When devices were used in common living spaces the parents were typically occupied with

Figure 3: People and material observed in the space with the child participant

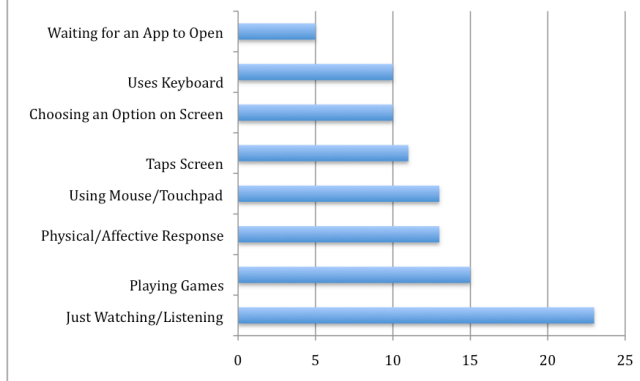


either filming the child or with household duties. Parents also tended to get the child set up with the technology or a specific software program and then left to accomplish another, unrelated task. Children also had very few other objects with them in the space, including toys (7%), paper/pens/pencils (6%), and food/drink (3%); however, they did not always interact with these materials while engaged in computing activities.

Young Children's Technology-Related Activities

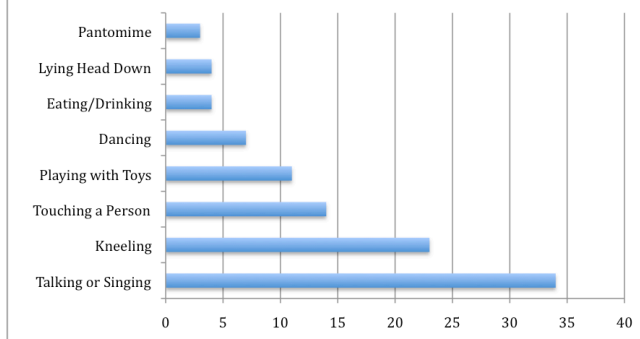
As outlined in Figure 4, children engaged in various technology-related activities while using their devices. They tapped the iPad screen while using an application (e.g., while playing the game Angry Birds), watched YouTube videos, looked at family photos, created digital artwork and listened to music. The most common technology-related activity was watching or listening to something on the computer screen (23%), although several children (13%) also responded by jumping or squealing in response to what was on the screen. For example, one child watching a video jumped at the moment a spider attacked a praying mantis. Playing a game on the device (15%) was also popular and comprised the next largest category of computer use. Some of the games were intended for young children (e.g., Bubble Guppies; Max & Ruby; Dora the Explorer). Others were not designed for preschool children, or even focused on an adult audience (e.g., Paper Toss; Angry Birds; Minecraft). However, these activities are not 'only entertaining for this age group; rather, young children learn from games and creative activities, absorbing information while engaging in fun and functional activities. The children observed in this study used the mouse/touchpad (13%) and keyboard (10%) to manipulate what was on the screen. The children did not ask for or appear to need much assistance from parents or siblings with mouse control, but most were helped with finding letters on the keyboard during a game or spelling words in a search. The children also spent time waiting for programs to load (5%) or selecting an option on the screen in front of them (10%).

Figure 4: Technology-related activities observed with child participants



Many children also engaged in physical activities in concert with technology use, such as talking or singing (34%) or touching another person (14%) while using the computer (see Figure 5). One child sang along while watching a family video of her birthday party the previous year. Although a number of children sat at tables or desks to use the computer, a number were kneeling on the floor (23%) while using the devices. It was interesting to note that children did not stand while using computers or mobile devices; only with an active program on the Wii console was standing observed. Dancing (7%), pantomime (3%), eating and drinking (4%) and laying their head on the desk (4%) were some of the other activities observed. The dancing that was observed was sometimes purposeful, in that a child searched for a particular popular dance move online (e.g., Gangnam Style) in order to learn the dance movements. In other cases, the dancing was in response to music that motivated the child to move. A few children played with toys (11%) while they used technology; in all cases, these toys were branded merchandise from a movie, TV show, or videos. Often, the toy and the computer program matched and, at times, the toy became part of the action (e.g., a Barbie doll was played with while a child sang along to an online Barbie video).

Figure 5: Physical Activities Observed with Child Participants



DISCUSSION AND CONCLUSIONS

Overall, these data present an exploratory, descriptive picture of young children's access to and use of technology devices in the home. Although children use a range of computing devices, and have access to various technologies in the home, the television and DVD player are the most commonly available. Mobile computing devices, including tablets and smartphones, are quite prevalent and generally available for child use; this is in contrast to desktop and laptop computers and other devices, which are restricted to adult use in almost 50% of cases. Data gathered here about the amounts and types of technology available to young children are consistent with other research, particularly studies of older children's use. Globally, the use of mobile devices by young children is increasing. One study notes an increase in mobile device use from 38% to 72% between 2011 and 2013 among children under age eight, with an increase from 10% to 38% in the same period for children under age two (Common Sense Media, 2013, p. 9). Holloway et al. (2013) note a general increase in availability of mobile tablet devices for children under age 6; for example, they cite reports saying that 50% of Swedish children aged 3-4 use tablets and 23% of Norwegian children aged 0-6 make use of these devices (p. 9). As Gutnick et al. (2011) point out, educators and media developers are now seeing great potential in smartphones to connect with children as the "next wave of consumers" and predict that more families will use these devices as prices decrease (p. 33). Further, they note "children's content makes up a substantial proportion (47%) of the 100 top-selling educational apps on iTunes, an interesting trend considering that children are not a primary market for either the iPhone or iPod touch devices" (Gutnick et al., 2011, p. 33).

Young children learn from games and creative activities, absorbing information while engaging with fun (and, often, educational) tools. As Downes (2002) found in her research of children between ages five and twelve, "children conceived of and used the computer as both a toy and a tool, and that when they were thinking of and using the computer as a tool, it was a 'playable' tool. Working with a playable tool provided opportunities for the blending of play, practice and performance" (p. 23). The use of the device itself serves an instructional purpose at a young age. As Radich (2013) notes, exploring computers in creative play allows "children to control the medium and the outcome of the experience, to explore the functionality of these tools and to pretend how they might be used in real life" (p. 7). Findings in this study related to children's use of technology and connections to online collections are also consistent with many of those discussed in Holloway et al.'s (2013) report; there, for example, they discuss a 2012 report from Childwise noting that "under the age of 3 or 4 [children] are more likely to spend their time watching video clips...[but] as these young children get older they widen their internet usage to include information seeking,

completing homework and socializing” (p. 12). Further, other studies of children under age eight note that “the most frequently used apps are educational games (43%...), games that are just for fun (42%), and creative apps such as those for drawing, making music, or doing things with photos (38%)” (Common Sense Media, 2013, p. 20).

Findings in this study that point to a large proportion (45%) of children engaging, independently, with technology are also comparable to previous studies of media use. Courage and Setliff (2009), for example, in their review of studies of young children’s media habits, cite one study that found that parents only viewed videos with their children 50% of the time (p. 75). Young children can and do engage actively with technology on their own and gain a great deal of information from independent engagement. As Holloway et al. (2013) note, “Apart from the obvious enjoyment many young children experience playing games, watching video clips and socializing online, their engagement with the internet helps to develop emergent digital literacies” (p.14). At the same time, other researchers note the value of educational opportunities for young children; these can be in-built in the system/software or provided by parents, siblings and other people that engage with the child. As Radich (2013) notes, “with adult mediation [preschoolers] can demonstrate mastery of simple digital devices” (p. 6). McManis and Gunnewig (2012) make the point that “Experiences with technology can pave the way for unprecedented learning opportunities. However, without an educational component, technology cannot reach its full potential for supporting children’s learning and development” (p.14).

By studying young children’s activities, connections to online collections, and home environments in more depth, researchers can gain a better understanding of the role of technology in shaping children’s experiences at a young age. This project provides one such view, of the learning and information-related potential of preschoolers’ engagement with technology tools. The range and depth of technology use reported in this study have implications for library and information professionals, as well as teachers and parents. For example, public and school librarians may wish to consider the types of technologies made available to preschoolers and their parents, for loan purposes and/or as part of existing library programs. Similarly, information sessions for parents could explore the types of applications and web-based platforms designed for young children, with a focus on various types of educational, informational and entertainment-focused programs. Providing young children with a range of opportunities to engage with various types of technologies and programs will not only enhance technical skills (e.g., using keyboards), but will also engage children in imaginative play in new and innovative ways.

This study also points to the need for more research on young children’s uses of technology in information science and in education. Recruiting larger samples of children’s homes (i.e., beyond the 15 studied here) will allow for

generalizable data that can point to broader trends across the population of children in this age group. Also, although specific demographic data (such as socio-economic status) were not gathered in this study, such details could provide more insight into trends across various types of home contexts. Conducting home-based analysis of technology use alongside analysis in formal school setting will also provide a richer understanding of young children’s experiences with technology. However, as children will also encounter technology in many other places and contexts (e.g., at friends’ homes, at grandparents’ homes, in the public library, etc.), in-depth and holistic data collection across the child’s life-world is required to gain a more complete picture of young children’s engagement with technology. As an exploratory study, this project is limited in its scope and in the implications for practice that can be drawn. Using observational data alongside other methods (such as qualitative interviews) can provide the opportunity to triangulate results to better understand how young children and their parents perceive the value of information technology.

It is also worth noting that the results also point to the potential for the ‘seating sweeps’ method to be applied to video recordings, rather than only being used in real-time contexts. Although there were some challenges in analysis (e.g., activity happening off-screen could not be coded), these instances were few in number. The data were gathered through fixed camera positions (e.g., next to a desktop computer) and situations where parents could reposition the camera to track children’s activities, as needed. This provided a robust dataset of children’s activities across the twenty-nine hours of recordings, with few instances of missing data. One of the significant advantages to this analysis process was that the researcher was not physically in the space during data coding; this would have been disruptive in the home environment, which is a critique of real-time data coding noted by Given and Leckie (2003) in their discussion of observer effect (p. 376). As an exploratory study of the potential fit for the ‘seating sweeps’ method as a coding tool for video recorded observational data, the results of this project point to a great deal of potential for future analysis across a range of informational contexts and with different types of participants.

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